The Millennium Cohort: a 21-Year Contribution to the Understanding of Military and Veterans' Health

Second Annual Trauma Stress Disorders Conference

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Science to Soldier

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Deployment Health Research

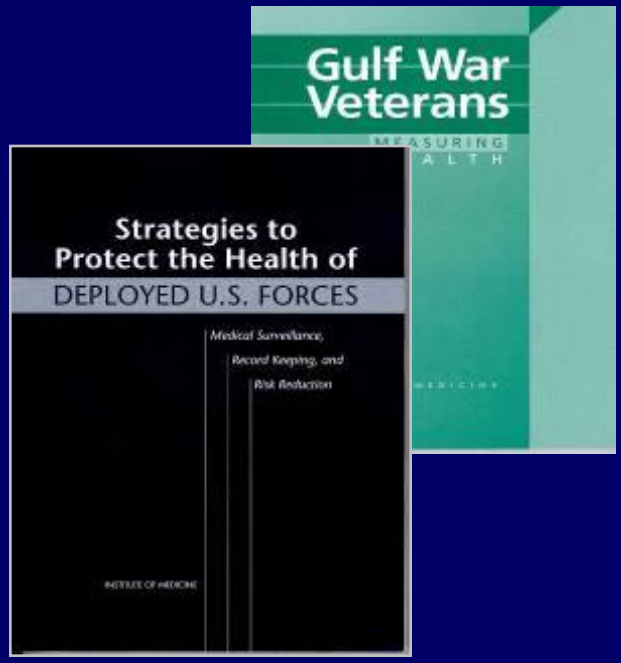
MILLENNIUM COHORT STUDY

Lessons learned from 1991 Gulf War

The Origins of the Millennium Cohort Study

MILLENNIUM COHORT STUDY

- **IOM recommended coordinated prospective cohort study of service members**
  - **Capitalize on new DoD surveillance and health care data**
  - **Data sources that were not available at the time of the Gulf War**
- **For the first time, measure the impact of deployment prospectively**



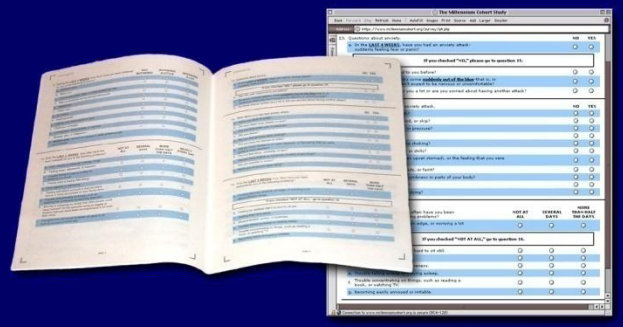
Section 743 of the FY1999 Strom Thurmond Act authorized the Secretary of Defense to establish a… ***longitudinal study*** ***to evaluate data on the health conditions of members of the Armed Forces upon their return from deployment.***

Background

- The Millennium Cohort Study is a longitudinal study designed to evaluate long-term subjective health and chronic diagnosed health problems, especially in relationship to exposures of military concern and deployments
- All services, active duty Reserve/National Guard
- Participants are re-surveyed at 3-year intervals including after service through 2022
- New accession cohorts were added in FY2004 and FY2007
- New accessions planned for FY2010, including a family component

Basic Methodology

- Survey refined based on focus group testing, pilot study, and expert review
- Questionnaire leverages standard instruments (PHQ, PCL, SF-36V, others)
- Includes measures of physical health, behavioral health, mental health
- Includes exposure questions, and other metrics (deployment, sleep, etc.)
- Participants respond via traditional paper, or over secure website



DMDC Reference # 00-0019 * RCS # DD-HA(AR)2106 * OMB Approval # 0720-0029
ASD/HA/TMA Protocol # CDO-06-206 * Primary IRB Protocol # NHRC.2000.0007

Current Status

2001: Study launched

77,047 enrolled in Panel 1 (Wave 1)

2004: Panel 1 follow-up and Panel 2 enrollment initiated

86,131 enrolled / followed-up

2007: Panel 1 and 2 follow-up; Panel 3 enrollment

~ 115,000 enrolled / followed-up

2010: Panel 1, 2, and 3 follow-up; Panel 4 enrollment

Follow-up on > 150,000

- **> 70% with at least 1 follow-up**
- **~ 50% deployed in support of operations in Iraq and Afghanistan**
- **~ 20% have left military service**
- **> 30 peer-reviewed publications**
- **> 150 scientific presentations with many awards**

DoD and VA Data Sources

Dept of Veterans Affairs Data

Environmental Exposure Data

Mortality Data

Deployment Data

Pharmacologic Data

Immunization Data

Family Data
e.g., DoD Birth and Infant Health Registry

Recruit Assessment Program

Civilian Inpatient and Outpatient Care

Military Inpatient and Outpatient Care

Survey Data

Medical History

DoD Serum Repository

Induction

Demographic Data

PTSD and Depression

- **PTSD Checklist-Civilian Version (PCL-C)[2]**
  - 17-item self-report measure (Likert 1 to 5)
  - PTSD if moderate or above level of at least one intrusion symptom, three avoidance symptoms, and two hyperarousal symptoms
  - And a score of 50 or more (range 17 to 85)

- **PRIME-MD Patient Health Questionnaire (PHQ)[1]**
  - Psychosocial assessment based on scores of several health concepts
  - Major depressive syndrome (9 items)
  - Panic syndrome (15 items)
  - Other anxiety syndrome (6 items)
  - Eating disorders (4 items; binge and bulimia nervosa)

Has your doctor or other health professional EVER told you that you have any of the following conditions?

…

PTSD

Depression

…

(Spitzer, 1994; Spitzer, 1999; Spitzer, 2000)[1], (Weathers, 1993; Blanchard, 1996)[2]

Baseline PTSD Prevalence

- At baseline, the weighted prevalence of PTSD was 3.6%
  - 1.2% reported PTSD diagnosis without current symptoms
  - 2.0% had PTSD symptoms without reported diagnosis
  - 0.4% reported PTSD diagnosis with symptoms

- Those with PTSD at baseline were more likely to be:
  - Women
  - Less educated
  - Never married or divorced
  - Current smokers
  - Problem alcohol drinkers

Smith TC, Wingard DL, Ryan MAK, Kritz-Silverstein D, Slymen DJ, Sallis JF, for the Millennium Cohort Study Team. PTSD prevalence, associated exposures, and functional health outcomes in a large, population-based military cohort. *Public Health Reports*. 2009 Jan;124:90-102.

Baseline PTSD Prevalence

	Millennium Cohort *N* = 74,947	PTSD diagnosis without current symptoms *N* = 951	No PTSD diagnosis with current PTSD symptoms *N* = 1,487	PTSD diagnosis with current PTSD symptoms *N* = 284
Functional health				
MCS, weighted mean (95% CI)	53.0 (52.9, 53.1)	48.5 (47.8, 49.3)	27.4 (26.8, 28.1)	26.0 (24.5, 27.4)
PCS, weighted mean (95% CI)	53.4 (53.2, 53.6)	50.0 (49.3, 50.7)	48.0 (47.3, 48.7)	43.2 (41.6, 44.9)

- **Those with PTSD symptoms (2.4%)**
  - **Significantly less favorable PCS and MCS scores**
- **Those with reported PTSD diagnosis without symptoms (1.2%)**
  - **Lower scores but closer to overall Cohort means**

New-Onset PTSD

New-onset PTSD symptoms or diagnosis, over the approximate 3 year period between baseline and follow-up, was identified in:

- **7.6% - 8.7% of those who deployed with combat**
- **1.4% - 2.1% of those who deployed without combat**
- **2.3% - 3.0% of those who did not deploy**

Smith TC, Ryan MAK, Wingard DL, Slymen DJ, Sallis JF, Kritz-Silverstein D, for the Millennium Cohort Study Team. New onset and persistent symptoms of posttraumatic stress disorder self-reported after deployment and combat exposures: prospective population-based US military cohort study. *British Medical Journal*. 2008 Feb;336(7640):366-71.

Persistent PTSD

Persistent PTSD symptoms or diagnosis, over the approximate 3 years between baseline and follow-up, was identified in:

43.5% - 47.9% of those who deployed with combat
22.4% - 26.2% of those who deployed without combat
45.9% - 47.6% of those who did not deploy

Photo source: http://www.defenselink.mil/multimedia

Prior Assault and New-Onset PTSD

- **New-onset PTSD symptoms or diagnosis among combat deployers was identified in:**

  Women

  - **21.7% of women who reported prior assault**
  - **10.1% of women who did not report prior assault**

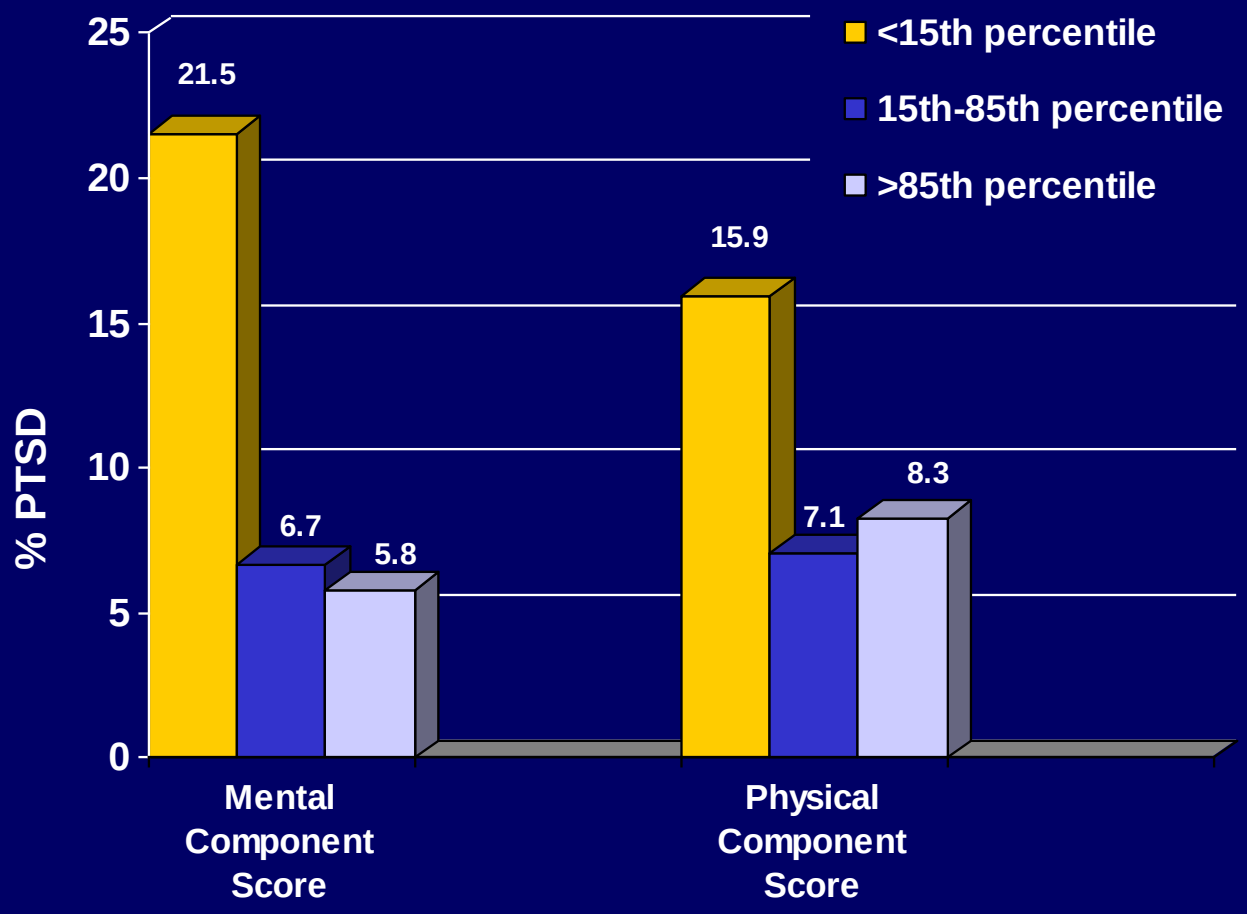
  Men

  - **12.4% of men who reported prior assault**
  - **5.9% of men who did not report prior assault**

- **In contrast to hypotheses that survival from trauma represents or confers resilience, these findings suggest vulnerability to combat stress and PTSD among survivors of prior assault**

Smith TC, Wingard DL, Ryan MAK, Kritz-Silverstein D, Slymen DJ, Sallis JF, for the Millennium Cohort Study Team. Prior assault and posttraumatic stress disorder after combat deployment. *Epidemiology*. 2008 May;19(3):505-12.

Functional Health and PTSD Symptoms



LeardMann CA, Smith TC, Smith B, Wells TS, Ryan MAK, for the Millennium Cohort Study Team. Baseline self-reported functional health predicts vulnerability to posttraumatic stress disorder following combat deployment: prospective US military cohort study. *British Medical Journal*. 2009: 338:b1273.

Positive and Negative Health Factors Associated with PTSD Symptoms

- Vigorous physical activity was associated with decreased odds of new-onset and persistent PTSD symptoms
- Light/moderate exercise at follow-up was also associated with decreased odds of new-onset PTSD symptoms
- Those with new-onset PTSD symptoms experienced a 3-4 lb weight gain over those with no PTSD symptoms
- New-onset and persistent PTSD symptoms in nondeployed was associated with weight gain over those with resolved or no PTSD symptoms
- Herbal therapy and megavitamin use significantly more prevalent among participants with PTSD symptoms

PTSD or Any Mental Health Diagnosis Among Those with PTSD Symptoms

PTSD Symptoms* 2001-2003 N = 1876	Dx code from time of symptom at 1 year (%)	3 years (%)	5 years (%)
PTSD dx (ICD-9-CM code 309.81)	2.3	4.8	6.7
Any mental health dx (codes 290-319x)	26.4	41.7	49.4

*PTSD sensitive criteria among Panel 1 baseline participants

- A relatively small percentage received a PTSD-specific diagnosis through their care in the military health system within 5 years
- Nearly half received any mental health diagnosis within 5 years
- Among those with PTSD symptoms and subsequent PTSD diagnosis code
  - ~ 2/3 had persistent PTSD symptoms at 3-year follow-up
  - ~ 1/3 had resolved PTSD symptoms at 3-year follow-up

Alcohol Problems

- Factors most strongly predictive of alcohol problems included younger age, smoking, and prior alcohol problems
- Reserve/Guard with reported combat exposures at increased odds of heavy weekly drinking, binge drinking, and alcohol-related problems
- Results consistent between men and women
- Results consistent across service branches

Jacobson IG, Ryan MAK, Hooper TI, Smith TC, Amoroso PJ, Boyko EJ, Gackstetter GD, Wells TS, Bell NS, for the Millennium Cohort Study Team. Alcohol use and alcohol-related problems before and after military combat deployment. *Journal of the American Medical Association*. 2008 Aug;300(6):663-75.

Smoking

- **Deployment associated with an increase in smoking**
  - **Increase predominantly due to smoking reuptake rather than smoking initiation**
  - **Among past smokers, deployment with combat, deploying multiple times, and deployment >9 months increased risk of smoking reuptake**
  - **Among baseline smokers, deployment <u>not</u> associated with increased amount of smoking**

Smith B, Ryan MAK, Wingard DL, Patterson TL, Slymen DJ, Macera CA, for the Millennium Cohort Study Team. Cigarette smoking and military deployment: a prospective evaluation. *American Journal of Preventive Medicine.* 2008 Dec;35(6):539-46.

New-Onset Depression

- **New-onset depression symptoms:**
  - **5.7% of men and 15.7% of women who deployed with combat**
  - **2.3% of men and 5.1% of women who deployed without combat**
  - **3.9% of men and 7.7% of women who did not deploy**
  - **Deployed men and women who reported combat exposures had a significantly increased risk for depression compared with nondeployed service members**
  - **In contrast, deployed men and women who did not report combat exposures were at significantly lower risk for depression than nondeployed men and women**

Wells TS, LeardMann CA, Fortuna SO, Smith B, Smith TC, Ryan MAK, Boyko EJ, Blazer D, for the Millennium Cohort Study Team. A prospective study of depression following combat deployment in support of the wars in Iraq and Afghanistan. 2009; AJPH, In press.

Limitations of Presented Studies

- Millennium Cohort is a random sample of the military population that may not be representative of all military personnel or those who deploy
- Those who were ill may have declined or participated in follow-up at different levels biasing new-onset estimates
- Self-reported exposure assessment is limited and not specific to deployment
- Use of a mental health screen as a surrogate for clinician diagnosis is imperfect

Strengths of Presented Studies

- 71% follow-up
- Prospective investigations of specific characteristics and select populations possible from a large population-based sample of all services and components
- Preliminary findings investigating follow-up non-response did not find significant differences in measures of effect for PTSD after adjusting for non-response
- Self-reported mental health symptoms may be a better representation of symptom prevalence than diagnoses in medical databases

Conclusions

- Combat exposures, rather than deployment itself, significantly affect onset of mental health symptoms, problem alcohol drinking, and cigarette smoking post-deployment
- Significant amount of newly reported smoking and problem drinking associated with newly reported mental health symptoms post-combat deployment
- Specific populations including those with poor mental and/or physical health, and prior stressful life events could be targeted for PTSD prevention programs

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Millennium Cohort Study Team, San Diego

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MILLENNIUM COHORT STUDY

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